

Recycling and Reusing Hardscapes and Landscape Waste Cost Calculator



This Cost Calculator is designed to help landscaping companies and landscape managers estimate the cost savings associated with recycling and reusing hardscapes and green waste. Green waste includes yard trimmings, leaves, plants, grass and other organic waste. The specific hardscape materials addressed in this tool include: lumber, brick, and concrete and asphalt. The Cost Calculator demonstrates that recycling and reusing hardscapes and landscape waste can offer significant savings compared to disposal, depending on a facility's material needs and proximity to recycling facilities.

Based on the values that you enter in the Inputs tab, the Cost Calculator tab estimates the cost of four scenarios for handling hardscape and landscape waste: (1) reusing all waste possible on-site, then recycling all waste possible, and then disposing of the rest; (2) reusing all waste possible and disposing of the rest; (3) recycling as much of the remaining waste as possible and disposing of the rest; and (4) disposing of all materials. If you are not generating a particular waste during a given time frame, enter "0" in the corresponding cell. Increasing the use of compost over time may offer additional cost savings in terms of reduced fertilizer and/or pesticide use, but the calculator does not consider these potential savings.

In the Cost Data tab, EPA provides national averages of costs associated with recycling and disposing landscape waste. Cost data collected from sources dated before 2006 are adjusted for inflation. If you prefer, you can substitute your own cost data into the green cells.

The EHS Benefits tab provides a summary of the environmental, health and safety benefits of recycling and reusing landscape waste.

Please direct any questions or comments on this cost calculator to: Jean Schwab, U.S. EPA GreenScapes Program Manager, schwab.jean@epa.gov or 703-308-8669.



Recycling and Reusing Hardscape and Landscape Waste



Green Waste

How many cubic yards of green waste are generated annually?	60
What percentage of the volume of green waste is wood > 1" diameter?	25%
How many cubic yards of compost will you use per year, on average over the next 10 years?	10
How many cubic yards of mulch will you use per year, on average over the next 10 years?	10
Do you own a large chipper (6"+) to chip lumber and large branches?	Yes <input type="button" value="v"/>
Do you have access to a local green waste recycler?	Yes <input type="button" value="v"/>
How much does green waste recycling cost per ton?	\$15.00

Lumber

How many linear feet of lumber will be removed within 1 year?	1000
Within three years?	3000
Within six years?	6000
Within ten years?	10000
What percentage of the volume of removed lumber is pressure treated?	0%
How many linear feet of lumber will you need within 1 year?	500
Within three years?	1500
Within six years?	3000
Within ten years?	5000
Do you have access to a local lumber recycler?	Yes <input type="button" value="v"/>
How much does lumber recycling cost per ton?	\$15.00

Brick

How many bricks will be removed within 1 year?	1000
Within three years?	3000
Within six years?	6000
Within ten years?	10000
How many bricks will you need with 1 year?	500
Within three years?	1500
Within six years?	3000
Within ten years?	5000
Do you have access to a local brick recycler?	Yes <input type="button" value="v"/>
How much does brick recycling cost per ton?	\$15.00
Do you plan on purchasing recycled bricks instead of new bricks for construction projects?	Yes <input type="button" value="v"/>
How much do recycled bricks cost (per used brick)?	\$0.20

Concrete & Asphalt

How many tons of concrete waste will be generated at your site within 1 year?	1
Within three years?	3
Within six years?	6
Within ten years?	10
Do you own a crusher to crush and reuse concrete and asphalt?	No <input type="button" value="v"/>
How many tons of asphalt waste will be generated at your site within 1 year?	1
Within three years?	3
Within six years?	6
Within ten years?	10
How many tons of crushed surfacing will you need within 1 year?	2
Within three years?	6
Within six years?	12
Within ten years?	20
Do you have access to a local concrete recycler?	Yes <input type="button" value="v"/>
How much does recycling concrete cost per ton?	\$15.00
Do you have access to a local asphalt recycler?	Yes <input type="button" value="v"/>
How much does recycling asphalt cost per ton?	\$15.00

Recycling and Reusing Hardscape and Landscape
Waste Cost Calculator



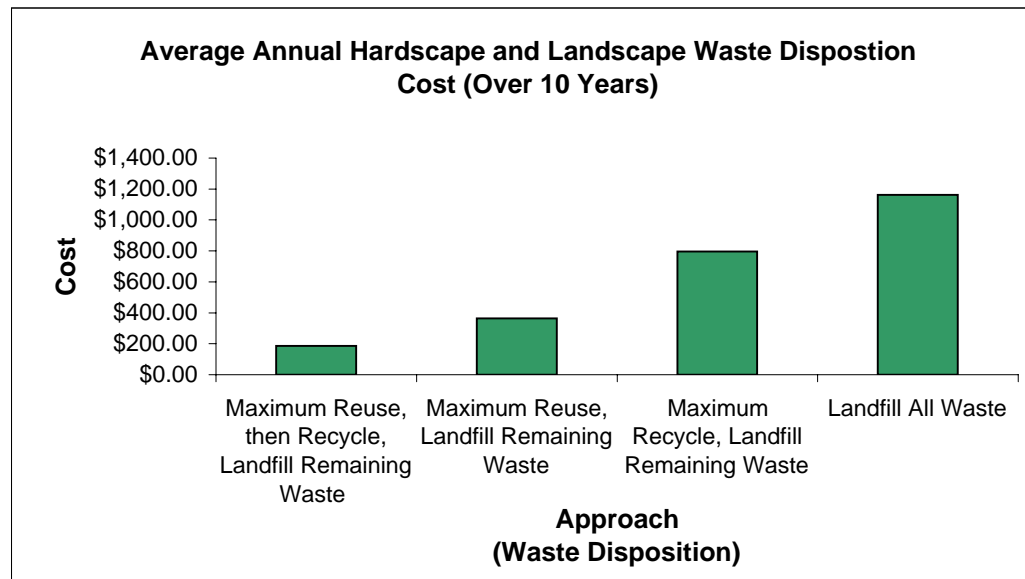
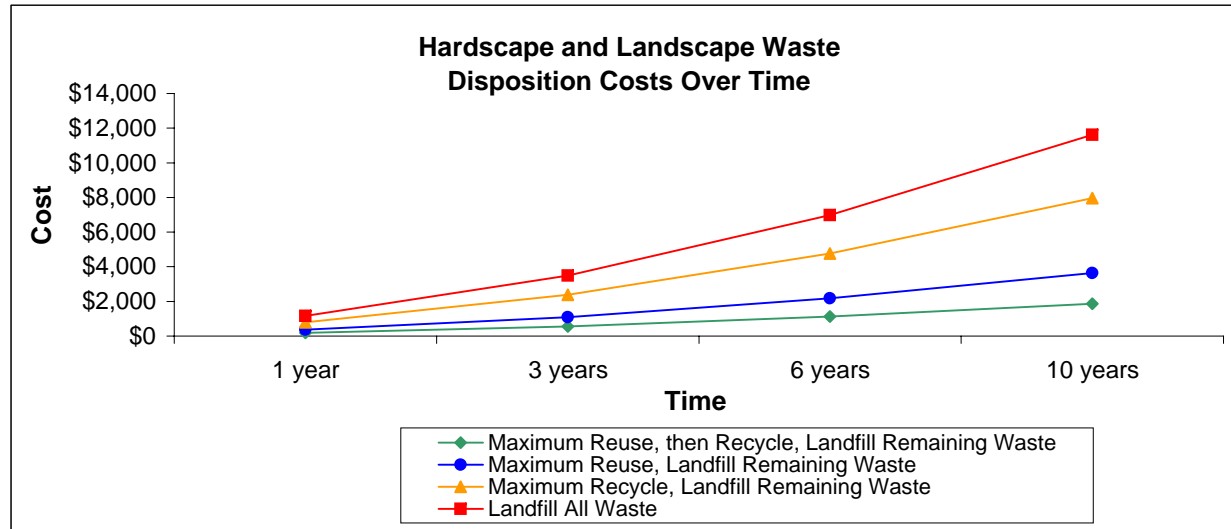
Maximum Reuse, then Recycle, Landfill Remaining Waste	1 year	3 years	6 years	10 years
New Material Cost				
Compost	\$0	\$0	\$0	\$0
Mulch	\$0	\$0	\$0	\$0
Lumber	\$0	\$0	\$0	\$0
Brick	\$0	\$0	\$0	\$0
Crushed Surfacing	\$22	\$67	\$134	\$223
Reuse Costs				
Initial Cost of Crusher	N/A	N/A	N/A	N/A
Crushing Labor	N/A	N/A	N/A	N/A
Crusher Maintenance	N/A	N/A	N/A	N/A
Initial Cost of Chipper	\$0	\$0	\$0	\$0
Wood Chipper Maintenance	\$23	\$70	\$141	\$234
Wood Chipping Labor	\$13	\$39	\$78	\$130
Recycling Cost/Disposal Cost				
Green Waste	\$70	\$210	\$420	\$700
Lumber	\$11	\$34	\$68	\$113
Brick	\$17	\$51	\$101	\$169
Asphalt	\$15	\$45	\$90	\$150
Concrete	\$15	\$45	\$90	\$150
Total Cost	\$187	\$561	\$1,121	\$1,869
Average Annual Cost to Date	\$187	\$187	\$187	\$187

Maximum Reuse, Landfill Remaining Waste	1 year	3 years	6 years	10 years
New Material Cost				
Compost	\$0	\$0	\$0	\$0
Mulch	\$0	\$0	\$0	\$0
Lumber	\$0	\$0	\$0	\$0
Brick	\$0	\$0	\$0	\$0
Crushed Surfacing	\$22	\$67	\$134	\$223
Reuse Costs				
Initial Cost of Crusher	N/A	N/A	N/A	N/A
Crushing Labor	N/A	N/A	N/A	N/A
Crusher Maintenance	N/A	N/A	N/A	N/A
Initial Cost of Chipper	\$0	\$0	\$0	\$0
Wood Chipper Maintenance	\$23	\$70	\$141	\$234
Wood Chipping Labor	\$13	\$39	\$78	\$130
Disposal Cost				
Green Waste	\$166	\$499	\$998	\$1,664
Lumber	\$27	\$80	\$160	\$267
Brick	\$40	\$120	\$241	\$401
Asphalt	\$36	\$107	\$214	\$357
Concrete	\$36	\$107	\$214	\$357
Total Cost	\$363	\$1,090	\$2,180	\$3,633
Average Annual Cost to Date	\$363	\$363	\$363	\$363

Maximum Recycle, Landfill Remaining Waste	1 year	3 years	6 years	10 years
New Material Cost				
Compost	\$161	\$482	\$963	\$1,605
Mulch	\$67	\$200	\$400	\$667
Lumber	\$180	\$540	\$1,080	\$1,800
Brick	\$100	\$300	\$600	\$1,000
Crushed Surfacing	\$22	\$67	\$134	\$223
Recycling Cost/Disposal Cost				
Green Waste	\$180	\$540	\$1,080	\$1,800
Lumber	\$23	\$68	\$135	\$225
Brick	\$34	\$101	\$203	\$338
Asphalt	\$15	\$45	\$90	\$150
Concrete	\$15	\$45	\$90	\$150
Total Cost	\$796	\$2,387	\$4,774	\$7,957
Average Annual Cost to Date	\$796	\$796	\$796	\$796

Landfill All Waste	1 year	3 years	6 years	10 years
New Material Cost				
Compost	\$161	\$482	\$963	\$1,605
Mulch	\$67	\$200	\$400	\$667
Lumber	\$180	\$540	\$1,080	\$1,800
Brick	\$100	\$300	\$600	\$1,000
Crushed Surfacing	\$22	\$67	\$134	\$223
Disposal Cost				
Green Waste	\$428	\$1,284	\$2,568	\$4,279
Lumber	\$53	\$160	\$321	\$535
Brick	\$80	\$241	\$481	\$802
Asphalt	\$36	\$107	\$214	\$357
Concrete	\$36	\$107	\$214	\$357
Total Cost	\$1,162	\$3,487	\$6,974	\$11,624
Average Annual Cost to Date	\$1,162	\$1,162	\$1,162	\$1,162

Recycling and Reusing Hardscape and Landscape Waste Cost Graph



On-site Asphalt and Concrete Crushing Costs				
	Units	Cost Estimate	Sources	Comments
Capital Cost	N/A	\$60,500	Concrete/Asphalt Crushers. September, 2003. < http://p2library.nfesc.navy.mil/P2_Opportunity_Handbook/7_III_6.html >	
Labor Cost	\$/Ton	\$6.60	Concrete/Asphalt Crushers. September, 2003. < http://p2library.nfesc.navy.mil/P2_Opportunity_Handbook/7_III_6.html >	
Equipment Maintenance Cost	\$/Ton	\$0.55	Concrete/Asphalt Crushers. September, 2003. < http://p2library.nfesc.navy.mil/P2_Opportunity_Handbook/7_III_6.html >	

Green Waste Grinding Costs				
	Units	Cost Estimate	Sources	Comments
Labor cost of green waste chipping/shredding	\$/Hour	\$24.25	Mulch Mule Brochure. Accessed August 28, 2007. < www.mulchmule.com/info/mulchmule2006.pdf >	This brochure says that the industry average for mulching-related labor is \$25/hour.
Time to shred/chip	Hours/CY	0.05	Personal Communication with Customer Service, BearCat. August 29, 2007	Bear Cat estimated that a 6" chipper can chip 100 feet per minute. 100 feet was multiplied by the amount of cubic yards in 1 foot of 2"x6" lumber. The inverse of this figure was divided by 60 to convert to hours/CY.
Maintenance of Commercial Chipper	\$/Hour Used	\$43.56		See Total Below
Initial Cost of 6" Commercial Chipper	N/A	\$7,759.03	Norwalk Power Equipment Company. Bear Cat Commercial Chippers (Gravity Feed) 6" Capacity - Bear Cat 71620. Accessed August 27, 2007.	The Bear Cat 71620 sells for \$7,999.
Amount Saved by Mulching	\$/CY	\$3.02		This is the amount saved by mulching on-site rather than buying mulch.

Chipper Maintenance		Cost	Replacement Time (Hours)	Cost Per Hour	Source	Comments
Blades		\$248	10	\$24.83	Customer service at Bear Cat provided estimates regarding how often each of these maintenance elements would be needed, as well as how much it would cost to replace all the blades and bearings. This information was given on August 30, 2007. The average price of gasoline, \$2.75 per gallon, was taken from the Energy Information Administration's U.S. Retail Gas Prices. Accessed August 30, 2007. < http://www.eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mo_gas_home_page.html >	\$248 is the retail price for the blade replacement kit
Gasoline		\$17.61	1	\$17.61		The average price of gasoline in the United States was multiplied by the volume of the chipper's gas tank.
Bearings		\$56	50	\$1.13		Each bearing costs \$29 and the chipper contains two bearings.
Total		N/A	N/A	\$43.56		

Landfill Costs				
	Units	Cost Estimate	Sources	Comments
All Waste	\$/Ton	\$35.66	Repa, Edward W. <i>NSWMA's 2005 Tip Fee Survey</i> . March 2005. < http://64.233.161.104/search?q=cache:z8bcOGKxHmUJ:wastec.isproductions.net/webmodules/webarticles/articlefiles/463-Tipping%2520Fee%2520Bulletin%25202005.pdf+average+landfill+tipping+fee&hl=en&gl=us&ct=clnk&cd=1 >	This is the national average tipping fee. Change the value in the green cell if you know your own tipping fee.

New Material Costs				
	Units	Cost Estimate	Sources	Comments
Compost	\$/Cu. Yard	\$16.05	Alexander, Ron, Tyler, Rod, and Goldstein, Nora. "Increasing Dollar Value for Compost Products." <i>BioCycle</i> , Oct. 2004 < http://www.environmental-expert.com/resultteacharticle4.asp?cid=6042&codi=4162 >.	
Mulch	\$/Cu. Yard	\$6.67	Earth Products. Orange County Landfill -- Orange County, NC. Accessed December 29, 2006. < http://www.co.orange.nc.us/recycling/earthproducts.asp >	Orange County landfill sells yard waste mulch for \$20 per 3 cubic yards. This price was divided by three to find the price per cubic yard.

On-site Asphalt and Concrete Crushing Costs					Comments
	Units	Cost Estimate	Sources		
Lumber (2"x 6" Decking Boards)	\$/LF	\$0.36	Lumber and Plywood Estimating Price Guide. Ace Hardware. January 30, 2006. < http://www.acehardware.net/estimate/ >.		The seven price estimates divided by their corresponding linear feet are all at or very close to \$0.36 per LF.
Brick	\$/Brick	\$0.39	Liu, Henry; Williams, Burkett and Haynes, Kirk. <i>Improving Freezing and Thawing Properties of Fly Ash Bricks</i> . March, 2005. < http://www.flyash.info/2005/20liu.pdf >.		This website states that ordinary bricks cost between \$300-\$400 per thousand. This range was averaged to \$350 per thousand or \$0.35 per brick.
Crushed Surfacing	\$/Ton	\$11.14	Dayton, Kevin J., State Construction Engineer, WSDOT Headquarters Construction Office. <i>Construction Update</i> . August 8, 2006. p. 1. < http://www.wsdot.wa.gov/biz/Construction/CostIndex/CostIndexPdf/constructionupdateareport.pdf >		

Conversion Factors	From	To	Factor	Source	Comments
Brick	Bricks	Tons	0.00225	Table 4. Accessed on November 4, 2006. < http://ntl.bts.gov/DOCS/tables2.html >.	This value was given in pounds and converted to tons by dividing by 2000.
2"x 6" Wood Decking Boards	Linear Feet	Tons	0.0015	Lumber Weight Calculator. Accessed November 4, 2006. < http://www.csgnetwork.com/lumberweight.html >.	This value was derived by using a lumber weight calculator. Pine was chosen to convert linear feet to tons because it is commonly used in decking. If you are using heavier wood(s), you may want to replace this conversion factor.
2"x 6" Wood Decking Boards	Linear Feet	Cubic Yards of Mulch	0.0031		One linear foot of 2"x6" contains .0031 cubic yards of wood.
Yard Waste	Cu. Yards	Tons	0.2	General Permit for Yard Waste Composting Facilities Under the South Dakota Waste Management Program. Board of Minerals and Environment. Department of Environment and Natural Resources. October 13, 1998. p. 6. < http://www.state.sd.us/DENR/DES/WasteMgn/SWaste/COMPGEN.pdf >.	This value was given in pounds and converted to tons by dividing by 2000.
Yard Waste to Compost	Cu. Yards	Cu. Yards	0.375	Wilson, C.R. and Feucht, J.R. <i>Composting of Yard Waste</i> . Colorado State University Cooperative Extension. October, 1997. < http://www.ext.colostate.edu/PUBS/GARDEN/07212.pdf >.	The article states that 50-75% of plant volume is reduced by composting. This range was averaged to derive a conversion factor.

Inflation Adjustment Table	
One Dollar in...	Equals this many 2006 Dollars
2003	\$1.10
2004	\$1.07
2005	\$1.04
2007	\$0.97

Source: *CPI Inflation Calculator*. <<http://data.bls.gov/cgi-bin/cpicalc.pl>>

Recycling and Reusing Hardscape and Landscape Waste Environmental, Health and Safety Benefits

Reduces waste/demand for landfill space because materials that would otherwise be disposed of are reused or recycled.

Reuses waste materials because hardscape and landscape waste is being reused directly on-site.

Reduces air pollution or improves air quality because reusing materials on-site results in fewer pollutants emitted from transporting waste materials, and methane emissions from landfills are reduced from both reuse and recycling.

Conserves fossil fuels because energy needed to transport both hardscape and landscape wastes, as well as new materials, will be reduced. Also, compost can reduce the need for chemical fertilizers, the production of which is fossil fuel intensive.

Conserves timber because reused and recycled lumber reduces demand for virgin lumber.

In addition to the above benefits, the following benefits are associated with maximizing compost use and minimizing use of fertilizers and pesticides:

Conserves water because compost can improve the water retention of the soil, reducing the need for irrigation.

Reduces human exposure to hazardous materials or substances because compost can reduce the need for pesticides and herbicides and the associated human exposures.

Reduces runoff and nonpoint source pollution because compost can substitute for pesticides and fertilizers, which can produce polluted runoff.

Improves groundwater recharge because compost increases the soil's ability to retain water.

Improves soil quality and retards erosion because using compost improves soil quality.



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Environmentally Beneficial Landscaping